

CLAIM AMENDMENTS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A method, comprising:

~~collecting identifying in a pre-boot environment~~ a plurality of module-to-module interfaces from a plurality of firmware modules, wherein a module-to-module interface allows a first firmware module of the plurality of firmware modules to invoke a second firmware module of the plurality of firmware modules;

~~collecting identifying in the pre-boot environment~~ a plurality of dependency expressions corresponding to the plurality of firmware modules, wherein each dependency expression of a firmware module describes the module-to-module interfaces needed for execution of the firmware module; [[and]]

~~evaluating in the pre-boot environment the dependency expressions to determine an optimized pre-boot dispatch order of the firmware modules;~~

~~dispatching in the pre-boot environment the firmware modules in response to the determined pre-boot dispatch order; and~~

~~providing pre-boot services to the dispatched firmware modules wherein the pre-boot services comprise temporary management of random access memory in the pre-boot environment.~~

~~sorting the plurality of firmware modules into an optimized order based on the plurality of dependency expressions and the plurality of module-to-module interfaces.~~

2. (Currently amended) The method of claim 1, further comprising computing a directed ~~acyclic~~ acyclic graph (DAG) based on the plurality of dependency expressions

and the plurality of module-to-module interfaces, the DAG to be used in sorting the plurality of firmware modules.

3. (Currently amended) The method of claim 1 wherein ~~collecting~~ the plurality of module-to-module interfaces have been provided by ~~comprises~~ collecting metadata from each module-to-module interface of the plurality of module-to-module interfaces, the metadata describing the module-to-module interfaces produced by the firmware module.

4. (original) The method of claim 1, further comprising generating an error if a firmware module of the plurality of firmware modules includes a dependency expression that refers to a module-to-module interface that is not produced by the plurality of firmware modules.

5. (original) The method of claim 1 wherein the plurality of firmware modules comprise a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs).

6. (original) The method of claim 5 wherein the plurality of module-to-module interfaces comprise a plurality of PEIM-to-PEIM Interfaces (PPIs).

7. (Currently amended) The method of claim 1, further comprising selecting bootstrap processors from a plurality of processors in the computer system in the pre-boot environment, wherein selecting the bootstrap processors comprises waiting for a

selected the processors to provide a status report of the selected process within a waiting time, generating a firmware volume (FV) for the computer system, the FV including the sorted plurality of firmware modules.

8. (Currently amended) The method of claim 7, wherein the firmware modules comprise drivers for components of the computer system that are to be executed by a yet-to-be-booted operating system, further comprising storing the FV in a non-volatile storage device of the computer system.

9. (Currently amended) The method of claim 7 wherein the [[FV to]] firmware modules operate in accordance with an Extensible Firmware Interface (EFI) specification.

10. (Currently amended) The method of claim 7, further comprising ~~generating an updated FV~~ using an FV-update utility to update the firmware modules.

11. (Currently Amended) An article of manufacture comprising:

a machine-accessible medium including a plurality of instructions which when executed perform operations comprising:

entering a pre-boot environment;

initializing in the pre-boot environment a Pre-EFI Initialization (PEI) foundation that includes a PEI Services Table that is accessible by PEI modules (PEIM) in the computer system, wherein each PEIM comprises a dependency expression, and wherein the PEI foundation comprises a PEIM dispatcher;

using the PEI foundation to provide PEIM services to the PEIMs; and

using the PEIM dispatcher to dispatch the PEIMs in accordance with the dependency expression of each PEIM.

~~starting a firmware volume build tool to generate a firmware volume (FV) for a computer system;~~

~~collecting a dependency expression from each of a plurality of firmware modules;~~

~~collecting metadata associated with each of the plurality of firmware modules, the metadata describing the module-to-module interfaces produced by each of the plurality of firmware modules;~~

~~sorting the plurality of firmware modules into an optimized order based on the dependency expressions and the metadata;~~

~~generating the FV, wherein the FV includes the plurality of firmware modules sorted in the optimized order.~~

12. (Currently amended) The article of manufacture of claim 11 wherein the dependency expressions have been generated using ~~execution of the plurality of instructions further perform operations comprising computing~~ a directed acycle graph (DAG) based on the dependency expressions and ~~[[the]] metadata, the DAG to be used in sorting the plurality of firmware modules.~~

13. (Currently amended) The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations ~~comprising storing the FW in a non-volatile storage device of the computer system of drivers for components of the computer system that are to be executed by a yet-to-be-booted operating system.~~

14. (Currently amended) The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising generating an error signal if the module-to-module interface of a dependency expression is not described in ~~[[the]] metadata associated with each PEIM firmware module of the plurality of firmware modules.~~

15. (Currently amended) The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising removing ~~[[the]]~~ metadata from each ~~PEIM firmware module of the plurality of firmware modules.~~

16. (Currently amended) The article of manufacture of claim 11 wherein the [[FV to]] PEIMs operate in accordance with an Extensible Firmware Interface (EFI) specification.

17. (Currently amended) The article of manufacture of claim 11 wherein ~~the plurality of firmware modules includes a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include each PEIM includes~~ PEIM-to-PEIM Interfaces (PPIs).

18. (Currently amended) A computer system, comprising:
a processor; and
a magnetic storage device operatively coupled to the processor, the magnetic storage device including instructions which when executed by the processor perform operations comprising:

collecting in a pre-boot environment a dependency expression from each of a plurality of firmware modules;

collecting [[a]] metadata from each of the plurality of firmware modules, the metadata describing module-to-module interfaces produced by a firmware module of the plurality of firmware modules;

sorting the plurality of firmware modules into an optimized order based on the dependency expressions and the metadata; and

generating a firmware volume (FV) that includes dispatching in the pre-boot environment the plurality of firmware modules ~~sorted~~ in the optimized order.

19. (Currently amended) The computer system of claim 18, further comprising a ~~second processor for dispatching the plurality of modules in the optimized order to a non-volatile storage device operatively coupled to the processor to store the FV.~~

20. (original) The computer system of claim 18, further comprising a network interface operatively coupled to the processor to receive at least one firmware module of the plurality of firmware modules.

21. (original) The computer system of claim 18 wherein the plurality of firmware modules includes a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include PEIM-to-PEIM Interfaces (PPIs).

22. (currently amended) A system, comprising:
data which encodes a set of firmware modules in a predetermined order, the predetermined order defined according to:
a dependency expression associated with each firmware module
of the set of firmware modules; and
metadata associated with each firmware module, the metadata
describing module-to-module interfaces produced by each firmware
module; and

code which in a pre-boot environment executes the set of firmware modules according to the predetermined order.

23. (original) The system of claim 22 wherein the data which encodes the set of firmware modules includes a firmware volume.

24. (original) The system of claim 22 wherein the code is executed during a pre-boot phase of a computer system.

25. (original) The system of claim 22 wherein the code which executes the set of firmware modules includes a PEI foundation module.

26. (original) The system of claim 22 wherein the set of firmware modules includes a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include PEIM-to-PEIM Interfaces (PPIs).

27. (Currently amended) The system of claim 22 wherein the data and the code ~~substantially~~ comply with an Extensible Firmware Interface (EFI) specification.